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Job No.: CTCE/BBMP/NE/W.No.09/WMM/Gradation/2016-17

08.09.2016

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **M/s. Nandi Enterprises,**
Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.

Name of Work : Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.

Reference : AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016

Date of Testing : 08.09.2016

Material : WMM

Sample Location : WMM Mix Plant

Oven Dry Wt (gm): **5000**

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	90	90	1.8	98.2	95-100
22.4	1520	1610	32.2	67.8	60-80
11.2	920	2530	50.6	49.4	40-60
4.75	685	3215	64.3	35.7	25-40
2.36	600	3815	76.3	23.7	15-30
0.600	585	4400	88.0	12.0	8-22
0.075	515	4915	98.3	1.7	0-8

Note:

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Basaveshwaranagar, Bangalore-560 079.

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Job No.: CTCE/BBMP/NE/W.No.09/WMM/Gradation/2016-17

08.09.2016

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **M/s. Nandi Enterprises,**
Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.

Name of Work : Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.

Reference : AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016

Date of Testing : 08.09.2016

Material : WMM

Sample Location : WMM Mix Plant

Oven Dry Wt (gm): **5000**

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	80	80	1.6	98.4	95-100
22.4	1690	1770	35.4	64.6	60-80
11.2	850	2620	52.4	47.6	40-60
4.75	750	3370	67.4	32.6	25-40
2.36	600	3970	79.4	20.6	15-30
0.600	500	4470	89.4	10.6	8-22
0.075	250	4720	94.4	5.6	0-8

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Job No.: CTCE/BBMP/NE/W.No.09/WMM/AIV/2016-17

08.09.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Source / Location	WMM Plant
Type of Mix	Wet Mix macadam
Date of Testing	08.09.2016

Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	390	392	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	88	89	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	355	360	
4	Aggregate Impact value = percent fines	22.56	22.70	
	100* (W_2/W_1)%			22.63

Comments:

→ Maximum allowable Aggregate Impact value for Wet mix Macadam is 30%

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Job No.: CTCE/BBMP/NE/W.No.09/WMM/AIV/2016-17

08.09.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Source / Location	WMM Plant
Type of Mix	Wet Mix macadam
Date of Testing	08.09.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	379	383	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	79	80	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	355	360	
4	Aggregate Impact value = percent fines	20.84	20.89	
	100* (W_2/W_1)%			**20.87**

Comments:

→ Maximum allowable Aggregate Impact value for Wet mix Macadam is 30%

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Job No.: CTCE/BBMP/NE/W.No.09/WMM/S-T/2016-17 08.09.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Technical Reference	IS 2386(Part 1) 1963 (RA 2011)
Type of Mix	Wet Mix Macadam
Date of Testing	08.09.2016

Civil Tech Consultants & Engineers Bangalore

Result : Flakiness Index = **12.13%**

Elongation Index = **13.28%**

Result : Combined Flakiness & Elongation index 25.41%

Comments:

Maximum allowable Flakiness & Elongation Index for Wet Mix Macadam is 30%

Note:

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Job No.: CTCE/BBMP/NE/W.No.09/WMM/S-T/2016-17 08.09.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Technical Reference	IS 2386(Part 1) 1963 (RA 2011)
Type of Mix	Wet Mix Macadam
Date of Testing	08.09.2016

Civil-Tech Consultants & Engineers Bangalore

Result : Flakiness Index = **11.58%**

Elongation Index = **13.20%**

Result : Combined Flakiness & Elongation index **24.78%**

Comments:

Maximum allowable Flakiness & Elongation Index for Wet Mix Macadam is 30%

Note:

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T-2377

Job No.: CTCE/BBMP/NE/W.No.09/CSR-08/119d/QB(SDBC)/2016-17 15.09.2016.

TEST REPORT ON DETERMINATION OF BITUMEN CHARACTERISTICS

***CUSTOMER**	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
***AGENCY**	:	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
***NAME OF THE WORK**	:	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	:	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
SAMPLE ID	:	Bitumen
DATE OF SAMPLING		13.09.2016
DATE OF TESTING	:	15.09.2016

The results of the tests conducted on the bitumen sample.

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2006
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	90	80 to 100
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	44	Min. 40
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	100 >	Min. 75
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	296	Min. 220

*Information furnished by the Customer/Representative

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VISHWANATH C.
Quality Manager

#23/14, 7th Cross, 3rd Stage, 4th Block, Shakthi Ganapathi Nagara, Basaveshwaranagar, Bangalore-79.
Tele Fax : 23223227, Website : www.civiltechconsultants.com
E-mail : vishwanath.ia@civiltechconsultants.com / info@civiltechconsultants.com

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Job No.: CTCE/BBMP/NE/W.No.09/SDBC/AIV/2016-17 15.09.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	15.09.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	382	383	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	80	81	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	302	302	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	20.94	21.15	**21.05**

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Job No.: CTCE/BBMP/NE/W.No.09/SDBC/AIV/2016-17 15.09.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	15.09.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	380	383	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	79	80	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	303	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	20.79	20.89	**20.84**

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Job No.: CTCE/BBMP/NE/W.No.09/SDBC/Shape_T/2016-17 : 15.09.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**: Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**: M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of Work	: Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	: AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Semi Dense Bituminous Concrete
Date of Testing	: 15.09.2016

Result : Flakiness Index = **11.39%**

Elongation Index = **13.20%**

Result : Combined Flakiness & Elongation index **24.59%**

Comments:

Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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CIVIL-TECH CONSULTANTS AND ENGINEERS

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Job No.: CTCE/BBMP/NE/W.No.09/SDBC/Shape_T/2016-17 : 15.09.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	: **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	: **M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of Work	: Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	: AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Semi Dense Bituminous Concrete
Date of Testing	: 15.09.2016

Result : Flakiness Index = **12.39%**

Elongation Index = **13.58%**

Result : Combined Flakiness & Elongation index **25.97%**

Comments:

Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/NE/W.No.09/SDBC/Stripping/2016-17 17.09.2016

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	17.09.2016

Type of binder : 80/100
Percentage of binder used : 5.0% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.0 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	3.1	3.30	96.70
2	3.3		
3	3.5		

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Comments:

→ Minimum allowable Aggregate retained coating for Semi Dense Bituminous Concrete is 95%

Note:

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Job No.: CTCE/BBMP/NE/W.No.09/SDBC/Sp_Wa/2016-17 17.09.2016

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Type of Mix	Semi Dense Bituminous Concrete
Source / Location	Hotmix Plant, Bangalore
Date of Testing	17.09.2016

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	2023	2024	2025	
2	Weight of basket suspended in water	W_2 g	755	755	755	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1268	1269	1270	
4	Weight of saturated surface dry aggregate in air	W_3 g	2015	2013	2011	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	747	744	741	
6	Weight of oven dried aggregate	W_4 g	1998	1995	1999	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.675	2.681	2.698	2.685
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.737	2.748	2.742	2.742
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.85%	0.90%	0.60%	0.78%

Comments:

→ Maximum allowable Aggregate Water absorption value for Semi Dense Bituminous Concrete is 2.0%

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Job No.: CTCE/BBMP/NE/W.No.09/SDBC/AGG/2016-17 17.09.2016

Aggregate Gradation Test

IS : 2386 Part I

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the Work	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Sample I / D	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete (SDBC)
Date of Testing	17.09.2016

Total Weight of Sample: **5150** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	317	6.2	6.16	93.84	90-100	
4.75	2650	51.5	57.61	42.39	35-51	
2.36	735	14.3	71.88	28.12	24-39	
1.18	485	9.4	81.30	18.70	15-30	
0.3	330	6.4	87.71	12.29	9-19	
0.075	350	6.8	94.50	5.50	3-8	

Total Weight of Sample: **5200** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	390	7.5	7.50	92.50	90-100	
4.75	2555	49.1	56.63	43.37	35-51	
2.36	875	16.8	73.46	26.54	24-39	
1.18	510	9.8	83.27	16.73	15-30	
0.3	250	4.8	88.08	11.92	9-19	
0.075	270	5.2	93.27	6.73	3-8	

Note:

Þ This test report should not be reproduced except in full, without written approval of the laboratory.

Þ The results indicated above are based on the tests carried out on the samples received in the laboratory.

Þ Any Query regarding the report must be reported within 30 days from the date of testing.

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CIVIL-TECH CONSULTANTS AND ENGINEERS

Building & Highway Material Testing Laboratory

An ISO 9001:2008 Certified Company

NABL - Accredited Laboratory as per ISO / IEC-17025 : 2005

JAS-ANZ BSCIC ISO 9001 REGISTERED

Job No.: CTCE/BBMP/NE/W.No.09/SDBC/Stability/2016-17 17.09.2016

TEST REPORT ON STABILITY OF MIX

Customer	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	:	**M/s. Nandi Enterprises,** Prop. Sri. P. Vijay Babu, #1504, 4th C Main, 2nd Stage, WOC Road, Bangalore – 86.
Name of the work	:	Improvements and Asphalting to roads at Vaishnavi Layout and surrounding areas in Ward No.09 in Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	:	AEE/BBMP/VSD/PR/230/2016-17 Dated: 16.08.2016
Source of location	:	Hot mix Plant, Bangalore
Type of Mix	:	Semi Dense Bituminous Concrete
Date of Testing	:	17.09.2016

The results of the tests conducted on the bituminous mix sample are as follows:

Sl. No	Description	Test Result 1	Test Result 2	Requirement as per MORTH (Table 500-16)
1	Marshal Stability, at 60° C, Kn	10.30	10.50	8.2 Kn (min)
2	Marshal flow at 60° C, mm	2.50	2.65	2 – 4
3	Percent air voids	3.25	4.15	3 – 5
4	Percent voids in mineral aggregates (VMA %)	14.15	14.30	13 - 15
5	Percent voids filled with Bitumen (VFB %)	72.75	72.40	65 – 78
6	Density, g/cc	2.27	2.28	---

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Note:

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